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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
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REPLY TO: 3420

DATE: February 23, 1988

SUBJECT: Evaluation of Ponderosa Pine Mortality at Roach Hill, Folsom Resource Area. (Report No. 88-8)

TO: District Manager - Bakersfield District

David Raney, Supervisory Forester, with the Bureau of Land Management and Folsom Resource Area, requested an evaluation of ponderosa pine mortality on a parcel administered by the BLM on the Foresthill Divide. The area was evaluated on December 10, 1987 by Dave Schultz, entomologist and James Allison, plant pathologist. They were accompanied by Dave Raney, three other BLM foresters, a forester from the California Department of Forestry and Fire Protection and a local private landowner.

Roach Hill is located at T. 15 N., R. 10 E., S. 22 at about 3,600 ft. elevation. Snow is infrequent because of the low elevation, but when it occurs, can cause top breakage in young trees. The area burned fairly extensively around 1960. Ponderosa pine was apparently quite prominent in the previous stand, with some California black oak, Douglas-fir and incense-cedar also present.

In the areas of concern, an overstory of several old-growth ponderosa pines per acre survived the burn and subsequent salvage efforts. Ponderosa pine seedlings were planted around 1965. Ponderosa pine also seeded in from the overstory, which resulted in stocking of over 1,000 trees per acre in some places. There was an almost complete cover of snowbrush and manzanita from 3 to 6 feet high in most places.

Some of the scattered old-growth ponderosa pine were dead or dying. The tops of many of the living overstory pines showed considerable branch and twig dieback, indicating that they had been declining for a number of years. An increment core from one of the dead trees showed a decline in radial growth beginning about 1950. The condition of the dead trees indicated that mortality occurred in both 1986 and 1987. Some currently top-killed trees will probably fade in 1988. The lower boles of the dead trees had been infested with various combinations of the western pine beetle, Dendroctonus brevicomis, red turpentine beetle, D. valens and California flatheaded borer, Melanophila californica. Some of the tops had probably also been infested with pine engravers, Ips spp.

The pattern of mortality as well as the variety of insects present suggests that the trees involved were under severe stress and that the beetles were simply taking advantage of the situation. The health of the overstory has been declining for decades. This process probably accelerated over the last 10 years

or so as the biomass of the plantation and brush increased and there were also several dry years. If precipitation is near normal, overstory mortality would be expected to decrease during the next few years because the biomass has been lowered by mortality. Any reduction in mortality should be viewed as temporary, however, because the biomass will increase again and precipitation will fluctuate. Unless the overstory is needed to accomplish wildlife or visual objectives, its prompt removal would maximize financial returns and should maintain or increase the growth rate in some parts of the plantation for a few years. At the present, the size difference between the overstory and the plantation is enough that a different complex of insects is capable of attacking each group of trees. As the plantation trees increase in size, they will become susceptible to the beetles that can attack the overstory. If the overstory has not been removed by that point, beetles attacking one of the decadent overstory trees may spill over and kill a small group of the surrounding plantation trees.

There are currently some groups of mortality in the plantation trees ranging up to an acre in size. The only insects involved in the mortality were pine engravers. There is very little overlap of the insect species involved in the mortality of the overstory and plantation. The reason that mortality occurred in both size classes of trees at the same place and time is that the underlying factors are the same. The underlying factors leading to the mortality were the large amount of biomass on the site and very dry conditions during the 1987 growing season. It is possible that pine engraver populations increased in pine tops broken by snow. The more likely role of snow breakage, however, is to serve as a reservoir for pine engraver breeding insuring that they are almost always present on the site.

Mortality due to pine engravers should decline shortly after precipitation returns to normal. Pine engravers have a short life cycle and populations fluctuate rapidly. Unless steps are taken to lower the amount of biomass on the site, they can be expected to cause mortality again in the future. Steps to reduce the biomass might include removal of the overstory, thinning of the plantation and brush control.

Management Alternatives

1. Do Nothing. Mortality in both the overstory and understory will decrease shortly after precipitation returns to normal. Mortality should be expected to flare up again in the future, probably in response to drought or some other form of tree stress. There will be an economic loss if the overstory trees which are killed are not salvaged. If mortality is frequent and scattered, repeated salvage efforts may divert time and money which could be used more efficiently for other management activities. A commercial stand will eventually result, although it will probably consist of stagnated, overstocked clumps of smaller diameter trees and scattered areas which are very poorly stocked.

2. Remove Overstory Trees. The greatest financial return would be realized by removing as many of the overstory trees as practical in one operation. Removal of the overstory trees would lower the biomass on the site, both by the felling of the individual overstory trees as well as any clearing necessary for access and log removal. A lower biomass would increase growth, and reduce susceptibility to bark or engraver beetle attack, of those trees adjacent to logged or cleared areas. The total benefit to the plantation is

likely to be relatively small and not distributed evenly over the plantation. If green slash produced from the overstory or plantation trees is not treated to make it unsuitable for breeding by pine engravers, they may build up and attack the adjacent plantation.

3. Thin Plantation Trees and Reduce Brush. In general, the plantation trees are about one-half to two-thirds the height and diameter of the same age trees from plantations which are relatively free to grow. Thinning and brush reduction would allow the plantation to reach merchantable size much sooner. For a plantation of this age and site quality, stocking of about 200-300 well distributed stems per acre would fully occupy the site and allow for reasonable growth. Thinning and brush reduction are generally cost-effective on productive sites from the standpoint of increased growth alone. In addition, thinning and brush reduction often prevent bark or engraver beetle attacks which can cause some areas of the plantation to be badly understocked.

Costs of precommercial thinning will vary with the method used. Regardless of the thinning method used, the green slash should be treated to make it unsuitable for breeding by pine engravers. Because the number of trees to be removed is much larger than those to be retained and the amount of slash that will be produced is large, the use of mechanical methods such as the Hydro-axe or Track-mac may be well suited. In addition to thinning and removing the aerial portions of brush in a relatively economical manner, these machines also break the debris into fairly small pieces. This will reduce the amount of material available for breeding by pine engravers and may reduce the fuel hazard. These machines will temporarily reduce the above ground portions of the brush, but most of the plants should be expected to resprout from the root crowns. For several years following treatment, the brush sprouts will provide increased cattle and wildlife browse.

4. Replant Mortality Spots. Some of the largest mortality spots could be replanted, if they were cleared. Openings in mature forests less than about one acre tend to have low survival and poor growth of seedlings due to shading and root competition from the mature timber. Because the plantation is still relatively young, it may be feasible to plant openings as small as 1/4 acre. Most of the current plantation is ponderosa pine. Planting other species would offer the advantage of avoiding some future host-specific pest problems. Douglas-fir and incense-cedar are both native to the area. Sugar pine should be avoided unless seed from sources resistant to white pine blister rust are available.

If you need further information or would like to discuss the alternatives, please call Dave Schultz at 415-556-4322.

/s/ John Allison

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